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The results of the experience in enforcing the payment of water bills in Dayton are shown in the accompanying table. The new system has eliminated all bad accounts. The last balance sheet showed three outstanding bills held for legal action and two for settlement by receivers. The system now meets with general favor. The discount is appreciated and the consumers are pleased because they know everybody gets exactly the same treatment. The results of the adoption of the system show that good business methods are popular and that a municipal department can make collections promptly if it chooses to do so.

H. C. WIGHT.

#### THE USE OF STATISTICAL DATA

Attention may profitably be directed to the paper by Mr. Wolman, in this issue of the JOURNAL, on the possibility of using index numbers to express the quality of water supplies. It is one of the few instances of the application of the science of statistics to the problems of water supply, and as that science can render great help to some of the technical branches of the business of supplying water it is regrettable that more attention has not been paid to it by water specialists. The misuse of technical statistical data is one of the most common errors seen today in technical papers. It is frequently the case that the results of investigations are tabulated in such a way that they mislead rather than instruct, and when the tabulated results are further altered by plotting their averages in diagrams the curves may convey impressions which are at wide variance with the actual facts.

The dangers of misuse can be illustrated by an example where they are generally appreciated. We are all familiar with diagrams which give the total rainfall for each month during a series of years. The rainfall for each month is indicated by a horizontal line and the diagram has the appearance of a succession of steps. There is no danger of improperly using this diagram, in all probability. But if any reader wishes to see how different the same data will appear in another grouping it is only necessary for the calendar months to be replaced by months beginning on the fifteenth day of each calendar month, or by weeks. Shortening the time interval, or the unit of measurement on the axis of abscissas, often introduces great irregularities into such diagrams. Such irregularities are not a matter of moment in water supply but they are vital in the disposal of storm water in our cities.

The relatively long-time periods of measurement employed by the water works designer must be replaced by the rainfall records in very short periods for the data to be of service to the designer of storm sewers. Such works based on any rational interpretation of monthly rainfall records would be found of inadequate capacity in most cases; the early combined sewers of Brooklyn afforded a convincing proof of this.

Another case of technical statistics was brought up at the last meeting of the Iowa Section by S. L. Etnyre, who urged that the American Water Works Association should take up the standardization of formulas for the velocity and loss of head in water mains. There are many such formulas in use today and numerous others which have been proposed but never came into use. Edward Wegmann has recently taken an active part in the development of one of them and Mr. Etnyre stated that he had worked one out. In each case they were based on tabulated data; in other words, they were problems in the interpretation of statistics.

Whether there is any call for the appointment of a committee to recommend a standard pipe formula is a matter for the members to determine; the Editor of the JOURNAL will be glad to receive their opinions on the subject, for the consideration of the Publication Committee. But if any thorough study of the subject is to be made, there are doubtless many users of pipe formulas who will be glad to have the proposed standard presented with the same class of data which accompany many similar statistical studies for the purpose of showing the range of accuracy of the formulas. In addition to the range of accuracy of the proposed formula as an average of the results of carefully and intelligently conducted pipe gaugings, there are also the very interesting questions concerning the effect of age and character of water on the capacity of mains, the influence of bends, reducers, gates and the like. From the viewpoint of a trained statistician, the problem is one which will occupy a committee several years before it can reach any useful conclusions, for much time must be spent in studying the experimental data and determining the weight to be given to each set of test results before it is possible to draw more definite conclusions from these data than have been deduced already by a number of students of the problem of the flow of water through pipes.

A. W. CUDDEBACK.